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A STUDY OF CUTTHROAT - STEELHEAD
IN ALASKA

AFS-42-10-A Darwin E. Jones

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ABSTRACT

This report covers the seventh year of study on steelhead trout, Salmon gairdneri Richardson, in southeast Alaska.

Sitkoh Creek, located on Chichagof Island, supports one of the best steelhead runs and sport fisheries in northern southeast Alaska. A project to determine the magnitude of the steelhead run and angler harvest at Sitkoh Creek was begun in mid-April 1982. A weir was constructed on lower Sitkoh Creek to enumerate the in-migrating steelhead.

The Sitkoh Creek steelhead run began on April 21, built to a peak in early May, and was complete by early June. During the 1 1/2-month season, 690 steelhead migrated upstream past the weir.

Age-length-weight and sex data were collected from all steelhead as they passed through the weir. The 690 steelhead sampled at the weir averaged 77.8 cm (30.6 inches) in length and 4.5 kg (10 pounds) in weight. Data collected from 45 sport caught steelhead averaged 86 cm (34 inches) in length and weighed 6.4 kg (14 pounds).

Age data were obtained by collecting scales as the steelhead passed the weir. A total of 671 weir-caught and 30 sport-caught readable steelhead scales were read for total age. Twenty six different age classes (ages 2.2 to 5.3) were found among the Sitkoh Creek steelhead population. During 1982, 76.5% of the Sitkoh Creek steelhead run was comprised of initial spawners and 23.5% were repeat spawners. Of all age classes, 47.7% were of age 3.2 and 3.3. Sex ratios were almost 1:1, with females being slightly more numerous.

The weir on lower Sitkoh Creek presented an opportunity to correlate stream foot counts with a known stream population. Foot surveys from Sitkoh Lake downstream to the weir counted an average of 8.56% of the steelhead known to be in the system.

A creel census of the steelhead anglers fishing Sitkoh Creek began on April 22 and continued on a daily basis until June 1. During this census, 116 anglers spent 239 angler-days of effort to catch 348 steelhead. Of this total, 45 steelhead were over the 84 cm (33 inches) minimum size limit.

The search for a suitable spring-run steelhead brood stock for the Sitka and Juneau areas continued. Surveys were conducted on Salmon Creek (Sitka) and Peterson Creek (Juneau). The numbers of steelhead observed in both streams were low, however, they were higher than in previous years.

KEY WORDS

Southeast Alaska, steelhead trout, Salmo gairdneri, population assessments, creel census.

BACKGROUND

Sitkoh Creek, on Chichagof Island, supports one of the best steelhead runs found in northern Southeastern Alaska. Sitkoh Creek attracts steelhead anglers from all urban centers of northern Southeast, with the majority of the anglers coming from Sitka.

The first bag and possession limits were imposed on Alaska steelhead fishermen in the mid-1940's. At that time, the limit was 20 trout or 15 pounds and one fish. In effect, this created a two steelhead-per-day bag limit, as Southeast steelhead averaged over 10 pounds each. This limit remained in effect until the mid-1950's, when the wording of the law was changed to drop the poundage limit. At that time, the limit was 20 trout per day, of which no more than three could exceed 20 inches in length. This action increased the steelhead daily bag limit to three fish per day, with two daily limits allowed in possession. The steelhead daily bag limit remained at three until 1975. Starting with the 1975 season, the daily bag limit was reduced to two steelhead over 20 inches, with a possession limit of two daily bag limits. The daily bag and possession limit was further reduced in 1978 to one steelhead over 16 inches for most of southeast Alaska and only one steelhead over 33 inches at Sitkoh Creek.

A creel census program at Sitkoh Creek was conducted between April 15 and May 28, 1978. The object of this census was to determine the harvest levels of steelhead for Sitkoh Creek. The census taker was stationed at the cannery in Sitkoh Bay and attempted to run the census on a daily basis. During the 44-day census, 62 anglers were observed harvesting 32 steelhead. This amounted to 0.51 steelhead per angler-day.

Efforts were also made in 1978 to estimate the number of steelhead in Sitkoh Creek. Foot surveys were conducted on May 16 from tidewater to Sitkoh Lake. A total of 18 steelhead were observed during this survey (Marriott et. al, 1978).

Foot surveys of Sitkoh Creek have been made on an annual basis since 1978. High counts of 41 and 42 steelhead were observed in 1980 and 1981,

respectively. These counts suggest that the steelhead escapements to Sitkoh Creek may have doubled since 1978.

Stream systems have been surveyed throughout southeast Alaska since 1976, looking for possible sources for steelhead brood stock. Peterson Creek, in the Juneau area, has been surveyed as a possible source of steelhead for use in northern Southeast Alaska. Salmon Creek, in the Sitka area, is a possible donor system for steelhead production in western Southeast Alaska. Falls Creek and Crystal Creek have been developed as sources of spring-run steelhead for the Crystal Lake Hatchery. Ketchikan Creek has been developed as a source of spring-run steelhead for the Deer Mountain Hatchery. Klawock River has provided adults for the development of fall-run steelhead at the Klawock Hatchery.

A list of common names, scientific names, and abbreviations of all species mentioned in this report is presented in Table 1.

RECOMMENDATIONS

Management

1. It is recommended that the regulations governing the Sitkoh Creek steelhead run be the same as the remainder of southeast Alaska.
2. Enumerate the steelhead population in Sitkoh Creek.

Conduct foot surveys of Sitkoh Creek on an annual basis during the middle of May to enumerate the steelhead run.

3. Obtain creel census data from Sitkoh Creek. Angler use and harvest of the Sitkoh Creek steelhead population should be collected on a periodic basis to evaluate existing management regulations.

OBJECTIVES

1. Determine the number and run timing of the steelhead trout immigrating into the Sitkoh Creek system during the spring of 1982.
2. Determine the length, weight, sex, and age composition of the Sitkoh Creek steelhead during the spring of 1982.
3. Determine the correlation between foot surveys and weir counts of Sitkoh Creek in the spring of 1982.
4. Determine angler effort and harvest at Sitkoh Creek during the spring of 1982.
5. Assess the abundance of adult steelhead trout in Peterson Creek (near Juneau) and Salmon Creek (near Sitka) to determine their suitability as future brood sources for steelhead enhancement projects in their respective areas.

Table 1. List of common names, scientific names, and abbreviations.

Common Name	Scientific Names & Authors	Abbreviations
Steelhead	<u>Salmo gairdneri</u> Richardson	SH
Cutthroat Trout	<u>Salmo clarki</u> Richardson	CT
Dolly Varden	<u>Salvelinus malma</u> (Walbaum)	DV
Sockeye Salmon	<u>Oncorhynchus nerka</u> (Walbaum)	RS
Rainbow Trout	<u>Salmo gairdneri</u> Richardson	RT

TECHNIQUES USED

Background information from prior studies conducted by the Alaska Department of Fish and Game and other agencies was reviewed.

The number and run timing of the steelhead population in Sitkoh Creek was determined by constructing a picket weir across the lower portion of Sitkoh Creek. The weir was installed and operational by mid-April. The weir incorporated an upstream trap. A section of the weir pickets were modified to pass downstream migrants. The weir was maintained 24 hours per day, 7 days per week, for the duration of the project.

The length, weight, sex, and age composition of the Sitkoh Creek steelhead population was determined by capturing all adult steelhead as they passed through the weir. The steelhead were anesthetized with tricaine methanesulfonate (MS-222) and then measured (fork length), weighed, and sexed. Scale samples were collected for age determination. A hole was punched in the lower caudal fin to aid in identification of fish that had passed upstream.

A correlation between foot survey counts and weir counts was made. A running count of the number of steelhead known to be in Sitkoh Creek at any given time was kept at the weir. Periodic foot surveys were conducted under variable weather conditions to obtain a correlation to those steelhead observed on a "peak count survey" to what was known to be the instream population.

Angler effort and harvest of steelhead at Sitkoh Creek was obtained. Anglers were contacted on a daily basis as they completed their angling day. These data were tabulated and used to correlate with other harvest studies.

The magnitude of the adult steelhead runs in Peterson Creek (near Juneau) and Salmon Creek (near Sitka) was determined by conducting periodic foot surveys throughout the steelhead season. Thus, establishing a peak survey count for each.

FINDINGS

Adult Steelhead--Numbers and Timing

Sitkoh Creek, located in Sitkoh Bay on the southeast tip of Chichagof Island (Figure 1), supports one of the major steelhead runs and sport fisheries in northern Southeast Alaska. A research project to study the Sitkoh Creek steelhead run and recreational harvest was undertaken during the spring of 1982. Weir supplies were obtained and transported to the site on April 13 (Figure 2). Construction of the weir and living quarters began on the 14th. The weir was completed and operational on the evening of April 16.

The in-migration of steelhead to Sitkoh Creek began on April 21. The run built steadily to a peak during the week of May 3-9, and then began to decline and was complete by the first of June (Table 2).

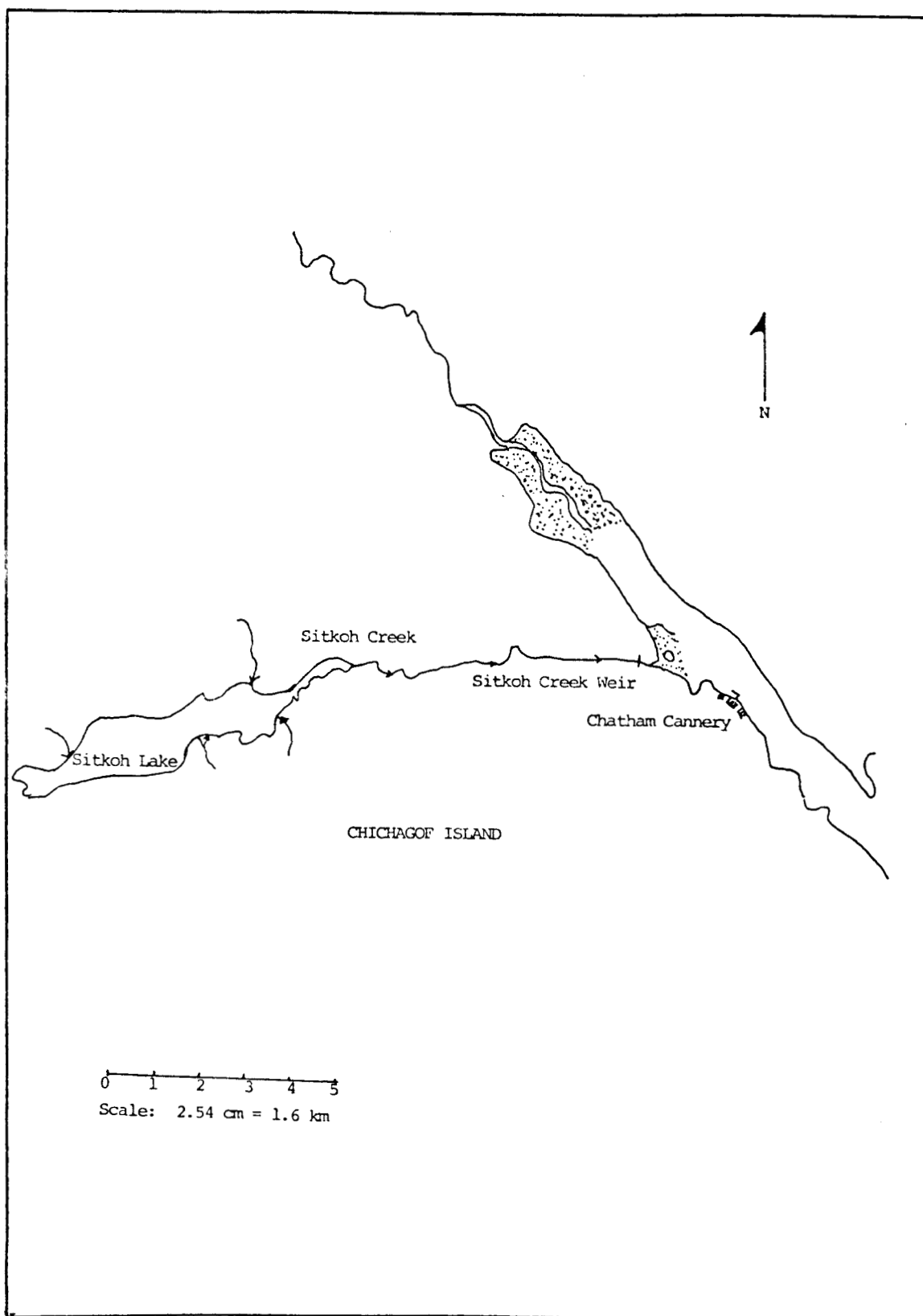


Figure 1. Sitkoh Bay, Chichagof Island.

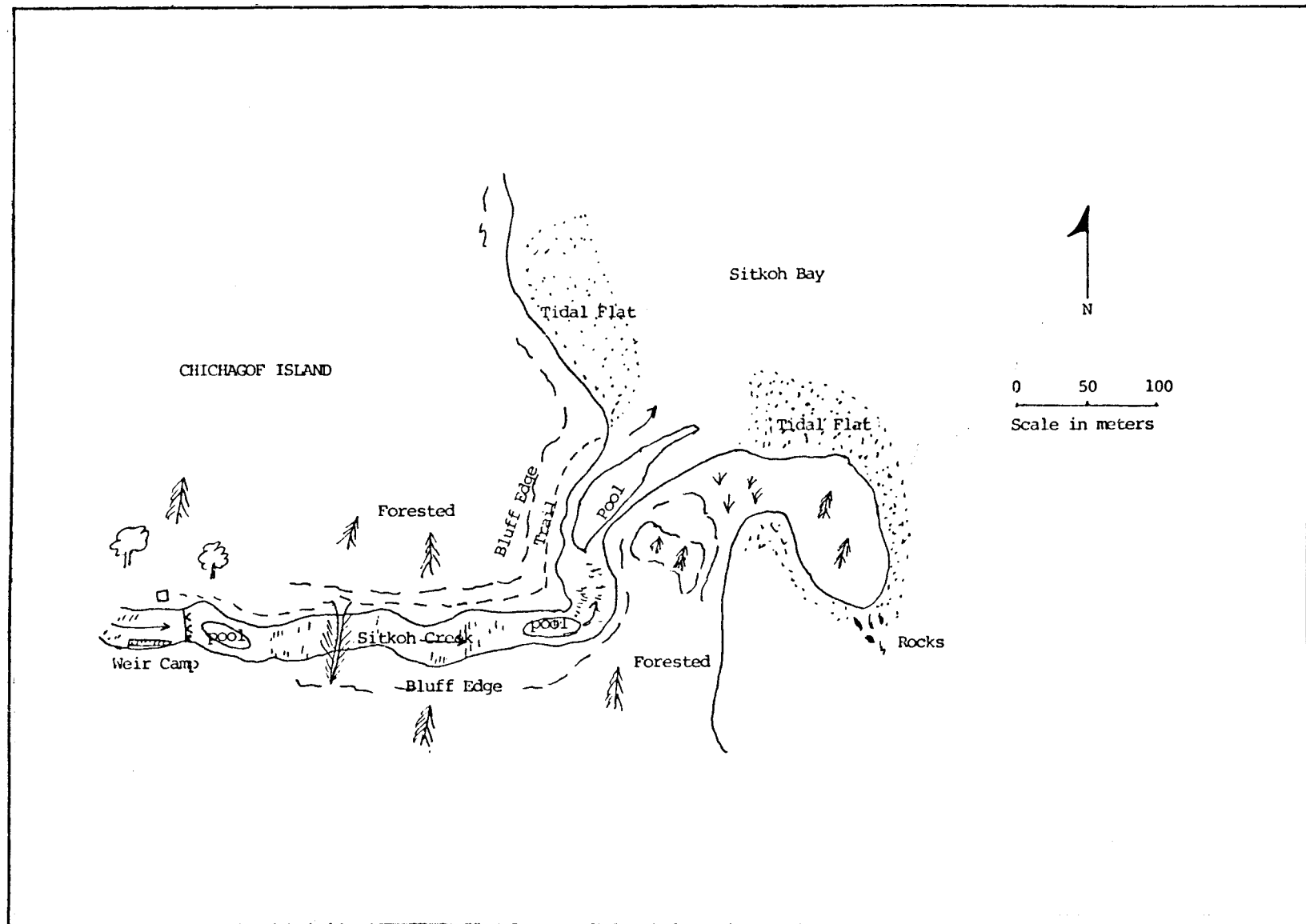


Figure 2. Sitkof Creek, Weir Site.

During the month and a half season, 690 steelhead migrated upstream past the weir. Over 60% of the total run was tallied during the 2-week period from May 3 through May 16 (Table 2).

Length and Weight

Length-weight relationships were collected from 690 adult steelhead as they passed through the weir. From the overall sample, the females averaged 10 cm longer than the males (Table 3). Very minor differences were noted in size between male and female steelhead taken in the sport fishery. This was expected, as all steelhead had to exceed 84 cm (33 inches) to be legal for possession in the sport fishery.

Of the 690 steelhead passed through the weir, 145 (21%) were over 84 cm (33 inches). This meant that one out of every five steelhead in the system was of a size large enough to be retained by sport fishermen.

The Sitkoh Creek steelhead compare favorably with steelhead sampled at Petersburg Creek (Jones, 1977). Petersburg Creek fish had an overall average length of 78.8 cm (31 inches), while those at Sitkoh Creek averaged 77.8 cm (30.6 inches).

Weights of steelhead sampled at the weir ranged from a low of 1.4 kg (3 pounds) to a high of 8.4 kg (18.5 pounds). Average weight for male steelhead (n=333) was 4 kg (8.8 pounds) and 5kg (11 pounds) for female steelhead (n=341), with an overall average (both sexes combined) of 4.5 kg (9.9 pounds) (Table 3). Sport caught steelhead (n=45) averaged 6.3 kg (13.9 pounds), which is 0.3 kg (1.9 pounds) over the standard set for "trophy" steelhead in Alaska.

Age and Sex

To obtain age and sex data from the steelhead run, scale samples were collected and the sex determined from all steelhead trapped during the in-migration. In addition to the weir samples, scales and sex data were collected from angler caught steelhead. A total of 674 weir caught and 30 sport caught steelhead scales were read to determine the age structure of the run. Twenty-six age classes (ages 2.2 to 5.3) were found among the Sitkoh Creek steelhead population in 1982 (Table 4).

Age classes are presented using the aging method described by Narver and Withler (1977). Repeat spawners are listed with an "S" after ocean age. This "S" is used to denote a successful spawning run and survival. Therefore, a steelhead with an age of 3.2S1 is 6 years old. Three years were spent in freshwater before smolt out-migration. Then 2 years (winters) were spent in saltwater, after which it returned to freshwater and spawned ("S"). This steelhead survived another year in saltwater (1) and had returned to freshwater on its second spawning run. Initial spawning steelhead are those fish without an "S" in their total age designation.

Examination of the scale samples obtained during the operation of the weir revealed that 76.5% of the run was comprised of initial spawning steelhead

Table 2. Daily In-migrant Steelhead Counts, Sitkoh Creek Weir, 1982.

Date	No. Males	No. Females	Total	No. Legal Size*
4/15	0	0	0	0
4/16	0	0	0	0
4/17	0	0	0	0
4/18	0	0	0	0
4/19	0	0	0	0
4/20	0	0	0	0
4/21	10	0	10	0
4/22	7	0	7	0
4/23	1	1	2	0
4/24	4	4	8	5
4/25	0	1	1	0
4/26	0	0	0	0
4/27	16	1	17	0
4/28	8	3	11	0
4/29	0	0	0	0
4/30	2	2	4	0
5/01	7	5	12	4
5/02	5	1	6	1
5/03	7	5	12	3
5/04	8	4	12	2
5/05	10	14	24	5
5/06	51	33	84	17
5/07	54	43	97	11
5/08	33	23	56	12
5/09	16	9	25	12
5/10	4	7	11	6
5/11	24	21	45	13
5/12	6	15	21	4
5/13	5	5	10	2
5/14	4	6	10	3
5/15	2	1	3	0
5/16	3	2	5	1
5/17	10	16	26	7
5/18	3	10	13	3
5/19	8	26	34	6
5/20	11	22	33	11
5/21	5	8	13	4
5/22	5	11	16	2
5/23	3	10	13	2
5/24	1	10	11	3
5/25	2	5	7	0
5/26	3	4	7	0
5/27	4	6	10	1
5/28	0	0	0	0
5/29	4	4	8	1
5/30	0	0	0	0
5/31	1	5	6	2
TOTAL	690	347	343	145

*Steelhead 33 inches or more in length.

Table 3. Steelhead Length-Weight Relationships, Sitkoh Creek, 1982.

	Number	Length		Weight	
		Average	Range	Average	Range
<u>Weir Sampled</u>					
Male	333	73.3 cm	62-89 cm	4 kg	1.4-8.4 kg
Female	341	82.4 cm	63-95 cm	5 kg	2.6-8.3 kg
<u>Sport Caught</u>					
Male	16	87.0 cm	84-96 cm	6.3 kg	5.0-7.2 kg
Female	29	85.7 cm	83-96 cm	6.4 kg	5.0-8.1 kg
TOTAL	719				

Table 4. Steelhead Age Classes, Sitkoh Creek, 1982.

Age Class	No. of Steelhead	No. of Females	No. of Males	% of Total
2.2	10	2	8	1.5
2.2S1	2	...	2	0.3
2.3	9	3	6	1.5
2.3S1	4	4	...	0.6
2.3S1S1	1	1	...	0.1
3.2	186	50	136	27.6
3.2S1	35	17	18	5.2
3.2S1S1	15	13	2	2.2
3.2S1S1S1	3	3	...	0.4
3.2S1S1S1S1	1	1	...	0.1
3.3	136	96	40	20.2
3.3S1	43	33	10	6.4
3.3S1S1	10	9	1	1.5
3.3S1S1S1	2	2	...	0.3
4.2	99	36	63	14.7
4.2S1	22	7	15	3.3
4.2S1S1	2	2	...	0.3
4.2S1S1S1	3	3	...	0.4
4.3	54	38	16	8.0
4.3S1	14	12	2	2.1
4.3S1S1	1	1	...	0.1
4.3S1S1S1	1	1	...	0.1
5.2	16	4	12	2.4
5.2S1	2	...	2	0.3
5.2S1S1	2	2	...	0.3
5.3	1	1	...	0.1
TOTAL	674	341	333	100.0

and that 23.5% of the run showed one or more spawning checks on their scales.

Steelhead spawning for the first time were from eight age classes (Table 5). Of all age classes, 47.7% were of age 3.2 or 3.3. The run of initial spawners contained 60.8% 2-ocean fish and 39.2% 3-ocean fish. The overall sex ratio of initial spawners (females:males) was 1:1.2.

The steelhead run was comprised of 23.5% repeat spawners. Eighteen age classes were represented among the 163 spawning steelhead sampled at the Sitkoh Creek weir (Table 6). Three age classes (ages 3.2S1, 3.3S1, and 4.2S1) comprised 61.4% of the repeat spawners. Repeat steelhead spawners, by sex, showed females to outnumber males by a ratio of 2.1:1.

Foot surveys were conducted on May 18 and May 30 from Sitkoh Lake to the weir site on lower Sitkoh Creek. On May 18, the weather was overcast with rain showers and the water level was 0.3 meters above normal. A total of 520 adult steelhead were known to be in Sitkoh Creek at the time and 45 (8.65%) were observed. The weather was bright and sunny and the water level was normal during the survey on May 30. Of the known 685 steelhead in Sitkoh Creek, the surveyors counted 58 (8.47%).

Surveys conducted at Petersburg Creek on known numbers of steelhead also turned up counts ranging from 8% to 10% of the population (Jones, 1976). Work at Sitkoh Creek in 1982, together with work done at Petersburg Creek, lends support to the hypothesis that no more than 10% of an adult steelhead population will be observed on a one-time foot survey during the peak of the run.

Creel Census

Prior to 1978, the steelhead run to Sitkoh Creek was managed by the same regulations as other systems in southeast Alaska. The increasing sport fishing effort on Sitkoh Creek resulted in a change in the bag limit in 1978 to a daily bag limit of one steelhead over 84 cm (33 inches). This regulation proved effective in reducing the harvest, however, there remain many unanswered management questions about the Sitkoh Creek steelhead run.

In 1982, the first anglers fished Sitkoh Creek on April 22. From then until the termination of the steelhead run in late May, anglers fished Sitkoh Creek on almost a daily basis. During the 1 1/2-month census, 116 anglers spent 238 angler-days fishing for steelhead. These fishermen caught 348 steelhead, of which 45 were over the 84 cm (33 inch) minimum size limit (Table 7). Fishing conditions in April were not the best and 57 angler-days were spent to harvest 15 steelhead. From May 1 through May 31 there were 181 angler-days spent on Sitkoh Creek, with a harvest of 30 steelhead. Depending on the angler's skill, weather, and the stage of the tide, most steelhead anglers averaged 1.5 steelhead per angling-hour.

The most intensively fished and most productive location on Sitkoh Creek was the large hole located at the high tide level (Figure 2). As many as ten anglers were observed fishing at one time in this area. Less than one angler in ten hiked more than 1.6 km upstream, even though this area contains many excellent angling areas. Nearly all anglers contacted were

Table 5. Age Classes of Initial Steelhead Spawners by Sex, Sitkoh Creek, 1982.

Age Class	No. of Steelhead	No. of Females	No. of Males	% of Total
2.2	10	2	8	2.0
2.3	9	3	6	1.8
3.2	186	50	136	36.4
3.3	136	96	40	26.6
4.2	99	36	63	19.4
4.3	54	38	16	10.5
5.2	16	4	12	3.1
5.3	1	1	...	0.2
TOTAL				
8	511	230	281	100.0

Table 6. Age Classes of Repeat Steelhead Spawners by Sex, Sitkoh Creek, 1982.

Age Class	No. of Steelhead	No. of Females	No. of Males	% of Total
2.2S1	2	...	2	1.2
2.3S1	4	4	...	2.5
2.3S1S1	1	1	...	0.6
3.2S1	35	17	18	21.5
3.2S1S1	15	13	2	9.2
3.2S1S1S1	3	3	...	1.9
3.2S1S1S1S1	1	1	...	0.6
3.3S1	43	33	10	26.4
3.3S1S1	10	9	1	6.1
3.3S1S1S1	2	2	...	1.2
4.2S1	22	7	15	13.5
4.2S1S1	2	2	...	1.2
4.2S1S1S1	3	3	...	1.9
4.3S1	14	12	2	8.6
4.3S1S1	1	1	...	0.6
4.3S1S1S1	1	1	...	0.6
5.2S1	2	...	2	1.2
5.2S1S1	2	2	...	1.2
TOTAL				
18	163	111	52	100.0

Table 7. Creel Census, Sitkoh Creek, 1982.

Date	Angler -Days*	No. of Steelhead Caught	No. of Steelhead Kept
4/19 - 4/25	32	46	8
4/26 - 5/02	40	59	8
5/03 - 5/09	54	82	12
5/10 - 5/16	60	87	12
5/17 - 5/23	31	45	5
5/24 - 5/31	21	29	0
TOTAL	238	348	45

*Angler-day is defined as one when an angler spent two or more hours fishing steelhead.

aware of the 84 cm (33 inch) minimum length requirement. By and large, anglers were enthusiastic over a "trophy stream" and seemed to think it was "a fine thing to have around."

Steelhead Brood Stock Development

The development of a brood stock of spring-run steelhead for southern and central Southeast Alaska was started at the Crystal Lake Hatchery (near Petersburg) in 1975. This program has been expanded to southern Southeast Alaska with steelhead programs at the Deer Mountain Hatchery (Ketchikan) and the Klawock River Hatchery (Craig-Klawock).

A genetic policy dictated that hatchery brood stocks would not be moved and released over a large geographical area. This policy has made it necessary to develop hatchery brood stocks for western and northern southeast Alaska.

Salmon Lake Creek

Salmon Lake Creek, located at the head of Silver Bay approximately 16 km southeast of Sitka, has been selected as the best potential source of steelhead brood stock for the Sitka area.

Past surveys have shown this system to contain a run of less than 100 spring-run steelhead annually. Stream surveys were conducted in mid-May from tide water to Salmon Lake (approximately 1.6 km). A total of nine steelhead were observed, with five actively spawning. In addition, six redds were observed in the first 150 meters below Salmon Lake. The 1982 survey was somewhat after the peak of spawning. The steelhead run to Salmon Creek probably did not exceed 100 adults.

Peterson Creek

Peterson Creek, located on the Juneau road system, has been surveyed on an annual basis since 1978. These surveys have shown that the run of steelhead to Peterson Creek is small; probably no more than 100 fish annually. The 1982 run was no exception.

Peterson Creek was foot surveyed in mid-May from tide water upstream for 4 km to the 15-meter barrier falls. A total of four adult steelhead were observed resting in pools near the barrier falls. In addition, 13 steelhead redds were observed in the upper 1.6 km of accessible stream. The number of redds and adults observed in 1982 was double the number observed on any previous survey, indicating that the 1982 run was above average.

DISCUSSION

During this research project, it was found that the steelhead run to Sitkoh Creek was stronger than had been expected. The best count recorded was during 1981, when 42 steelhead were observed on a 1-day survey.

The weir counts at Petersburg Creek in the early 1970's and at Sitkoh Creek in 1982 have shown that foot surveys normally do not tally more than 10% of

what is in the system. If this is the case, the run to Sitkoh Creek has most likely exceeded 700 steelhead for the past three seasons.

A weir was placed across Sitkoh Creek during 1936 and 1937 to enumerate the steelhead run. In 1936, a total of 760 steelhead were counted. This jumped to 1,108 in 1937. The 770 steelhead enumerated at Sitkoh Creek in 1982 compares favorably with counts obtained in 1936.

Angler harvest at Sitkoh Creek does not appear to be a limiting factor on adult steelhead numbers. Anglers harvested only 6.2% of the steelhead run to Sitkoh Creek in 1982. This is within the range that is acceptable for maintaining or increasing a wild steelhead population.

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